



Australian Government

Department of Education, Employment and Workplace Relations

MSL975022A Perform food analyses

Revision Number: 1

MSL975022A Perform food analyses

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse the nutrient and ingredient composition of foods and the identification and quantification of both chemical and biological contaminants within raw and processed foods. These tests may involve complex sample preparation followed by multi-staged and/or multi-instrumental analysis, immunoassay and computer-based nutrient analysis.
------------------------	---

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technical officers and analysts working in the food and beverage processing industry sectors. All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. The unit covers tests and procedures that are usually performed in a full or partially computerised and automated laboratory environment. Although a supervisor may not always be present, the technical worker will follow standard operating procedures (SOPs) that clearly describe the scope of permitted practice including varying enterprise/test procedures and communicating results to people outside the laboratory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.
--------------------------------	---

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974004A	<i>Perform food tests</i>
		OR
	MSL974006A	<i>Perform biological procedures</i>
	MSL973007A	<i>Perform microscopic examination</i>
	MSL973004A	<i>Perform aseptic techniques</i>

Employability Skills Information

Employability skills	This unit contains employability skills.
----------------------	--

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
---	--

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Establish client needs and schedule analysis	1.1. Liaise with client or sample provider to determine client needs and sample history 1.2. Record sample description, compare with specification and record and report discrepancies 1.3. Identify non-routine samples and the possible need to vary enterprise procedures 1.4. Seek advice from supervisor about any proposed variations and document all approved changes 1.5. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Obtain a representative analytical portion of the laboratory sample 2.2. Prepare sample in accordance with testing requirements 2.3. Prepare validation checks and/or calibration standards for analytical portion 2.4. Use specialised procedures for ultra-trace sample and standard preparation, as required
3. Set up and optimise instrument	3.1. Perform pre-use and safety checks using enterprise procedures 3.2. Start up and condition the instrument using enterprise procedures 3.3. Optimise instrumental parameters to suit sample and test requirements 3.4. Check calibration status of instrument and perform calibration using specified standards and procedures, if applicable
4. Perform analysis	4.1. Measure analyte response for standards, validation checks and samples 4.2. Conduct sufficient measurements to obtain reliable data 4.3. Return instruments to standby or shutdown condition as required 4.4. Store unused/prepared laboratory samples for future reference if required
5. Process and analyse data	5.1. Confirm data is the result of valid measurements 5.2. Perform required calculations and ensure results are consistent with standards or estimations and expectations 5.3. Record results with the appropriate accuracy,

ELEMENT	PERFORMANCE CRITERIA
	precision and units 5.4. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5. Troubleshoot analytical procedure or equipment problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Identify risks, hazards, safety equipment and control measures associated with sample handling, preparation and analytical method 6.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 6.3. Minimise the generation of wastes and environmental impacts 6.4. Ensure the safe disposal of laboratory wastes 6.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system (LIMS) 7.2. Maintain equipment logs in accordance with enterprise procedures 7.3. Maintain security, integrity and traceability of samples and documentation 7.4. Communicate results to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting client requests, test methods and procedures accurately
- safely setting up, starting up and shutting down equipment using enterprise procedures
- checking calibration/qualification status of equipment
- handling, preparing and storing samples and standards appropriately
- choosing and optimising procedures and equipment settings to suit sample/test requirements
- operating equipment to obtain valid and reliable data
- calculating analyte concentrations with appropriate accuracy, precision and units
- recognising atypical data/results
- troubleshooting common analytical procedure and equipment problems
- applying theoretical knowledge to interpret data and make relevant conclusions
- recording and reporting data/results using enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- following occupational health and safety (OHS) procedures and principles of good laboratory practice (GLP)

Required knowledge

Required knowledge includes:

- structure, properties and nutritional value of proteins, lipids, carbohydrates, vitamins and minerals and fibre
- chemical composition of common food and beverages and the methods that can determine their composition
- key food processing and preservation techniques and their effect on nutrients
- packaging and controlled atmosphere storage and their effect on nutrients
- glycaemic index (GI) and its significance
- significance of digestion and absorption of macro and micro-nutrients in food and the implications of food additives and fortification on absorption of nutrients such as fortification of milks with iron (Fe) and calcium (Ca) and breakfast cereal with Fe
- interrelationships of specific nutrient composition with public health and health promotion issues
- food labeling regulations and their implications for nutritional claims
- micro-organisms responsible for food spoilage, contamination, food borne disease and used in food processing for preservation or probiotic application

REQUIRED SKILLS AND KNOWLEDGE

- quality control programs for raw materials, process control and finished product inspection
- sample preparation methods and correct storage conditions for specific food samples and tests
- principles and concepts related to instrument operation, material preparation and testing
- function of key components and sub -system of the instrument
- effects on outputs and results of modifying instrumental variables
- procedures for optimising instrument performance
- basic procedure and equipment troubleshooting techniques
- preparation and use of calibration charts and/or standards
- calculation steps to give results in appropriate units and precision
- sources of error in specific tests and reproducibility and accuracy of commonly used test method for nutrient analysis
- enterprise and/or legal traceability requirements
- basic equipment maintenance procedures
- relevant health, safety and environment requirements
- emerging character of pharmaceutical properties of foods and probiotics
- public perception of food safety including genetically modified foods and food irradiation
- role, and methods, of production of genetically modified foods in the market
- nature, structure and function of food additives
- food allergies and intolerances
- food legislation relevant for enterprise
- hazard analysis and critical control points (HACCP) procedures for enterprise

Additional knowledge requirements may apply for different food processing industry sectors, such as dairy, grains, fruit and vegetables, meat and cereals

Evidence Guide

EVIDENCE GUIDE

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessors should ensure that candidates can:

- interpret client requests, test methods and procedures accurately
- safely set up, start up and shut down equipment using enterprise procedures
- check calibration/qualification status of equipment
- handle, prepare and store samples and standards appropriately
- choose and optimise procedures and equipment settings to suit sample/test requirements
- operate equipment to obtain valid and reliable data
- calculate analyte concentrations with appropriate accuracy, precision, uncertainty and units
- recognise atypical data/results
- troubleshoot common analytical procedure and equipment problems
- apply theoretical knowledge to interpret data and make relevant conclusions
- record and report data/results using enterprise procedures
- maintain security, integrity and traceability of samples and documentation
- follow OHS procedures and principles of GLP.

Context of and specific resources for assessment

This unit of competency is to be assessed in the workplace or simulated workplace environment.

This unit of competency may be assessed with:

- *MSL925001A Analyse data and report results.*

Resources may include:

- standard laboratory with appropriate analytical instruments, laboratory reagents and equipment and samples
- SOPs and test methods.

Method of assessment

The following assessment methods are suggested:

EVIDENCE GUIDE

- review of test data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results
- inspection of test records and workplace documentation completed by the candidate
- observation of candidate using instruments to conduct food analyses
- feedback from clients, peers and supervisors
- oral or written questioning of relevant principles, concepts, analytical techniques and enterprise procedures.

In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly.

Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.

Access must be provided to appropriate learning and/or assessment support when required.

The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.

This competency in practice

Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting.

Food processing (1)

A food laboratory technician is required to conduct nutritional analyses to meet Food Standards nutrition labelling requirements for a client's food sample. The client's product makes nutritional claims (for cholesterol and fatty acids) which require more than the standard format for a nutrition information panel (for energy, protein, total fat and saturated fat, carbohydrate, sugars and sodium). The technical officer schedules the nutritional assays according to enterprise procedures, sets up and calibrates the equipment, and prepares the samples and controls. She/he performs all required analyses carefully, recording sufficient readings to obtain

EVIDENCE GUIDE

reliable data for all samples and controls and satisfying all quality assurance and client specific requirements. The technician presents the analytical data to her/his supervisor for checking and signing off within specified time frame and the results are released to client.

Food processing (2)

A new breakfast cereal is going to be launched. The cereal has been developed, a manufacturing process devised and the marketing and legal teams have collaborated with the food technologists to determine what information needs to be on the label and what can be proclaimed on that label. The cereal has been fortified with iron and the laboratory team is requested to perform analyses on the product to confirm the nutrient analysis. This analysis will involve chemical and biochemical food analyses as well as computer nutrient analysis based on ingredient quantities computed for adding during manufacture. The technical officer is allocated the task of estimating iron levels by nutritional analysis (computer-based) and using atomic absorption spectrophotometry (AAS) on the ashed sample.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Codes of practice

Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, codes, procedures and/or enterprise requirements

Standards, codes, procedures and/or enterprise requirements may include:

- Australian and international standards such as:
 - AS 1766.0-1995 Food microbiology - General introduction and list of methods
 - AS ISO 1000-1998 The international system of units (SI) and its application
 - AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
 - AS/NZS 2243 Set:2006 Safety in laboratories set
 - AS/NZS ISO 9000 Set:2008 Quality management systems set
- Australia New Zealand Food Standards (ANZFS) Code
- Australian code of good manufacturing practice for medicinal products (GMP)
- Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982
- Australian Quarantine and Inspection Service (AQIS) Import Guidelines
- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- equipment startup, operation and shutdown procedures
- gene technology regulations
- industry standards, such as Royal Australian

RANGE STATEMENT	
	Chemical Institute (RACI) or American Association of Cereal Chemists (AACC) methods for colour, moisture, total ash, fats and proteins, nitrogen, fibre, micro-organisms and viscosity • material safety data sheets (MSDS) • material, production and product specifications (including maximum residue levels) • national measurement regulations and guidelines • principles of GLP • production and laboratory schedules • quality manuals, equipment and procedures manuals • SOPs and in-house methods • Therapeutic Goods Regulations 1009 • test methods and SOPs involving, for example, sampling, sample preparation, storage, disposal, transport, data quality, waste minimisation, cleaning and hygiene and safety • nutrient analysis or food composition tables • Australia New Zealand Food Authority (ANZFA) Code and User Guides • National Association of Testing Authorities (NATA) Accreditation programs requirements • Association of Analytical Communities International (AOAC International) Official Methods of Analysis
Analytical instruments	Analytical instruments may include: • Spectrometric instruments: • ultraviolet-visible (UV-VIS) • infrared including Fourier transform infrared and near infrared • atomic absorption including flame and flameless • fluorescence, flame emission, inductively coupled plasma (ICP) optical emission and inductively coupled plasma-mass spectrometry (ICP-MS) • chromatographic techniques and instruments: • paper such as ascending and descending • thin layer such as ascending, high

RANGE STATEMENT	
	performance, radical and descending • column chromatography • affinity chromatography and gel filtration chromatography • gas liquid and gas solid chromatography • high performance liquid chromatography (HPLC) such as liquid-liquid (LLC), liquid-solid (LSC), ion (IC), size exclusion (SEC) • gas chromatography mass spectroscopy (GC-MS) • electrophoretic techniques, such as capillary electrophoresis • electrometric techniques: • ion-selective electrodes • potentiometric titrations • conductometric titrations • amperometry • polarography
Sample preparation:	Sample preparation may include: • identification of any hazards associated with the samples and/or analytical chemicals • grinding to required particle size, milling, preparation of disks, digestion, dissolving, ashing, refluxing, extraction, filtration, evaporation, flocculation, precipitation, washing, drying, centrifugation, degassing and temperature equilibration • culturing of micro-organisms • determination of, and if appropriate, removal of any contaminants or impurities • ultra-trace procedures requiring high purity solvents, clean rooms, ultra clean glassware and specialised glassware
Nutrient analysis may	Nutrient analysis may include: • percentage composition of foods for major macro-nutrients such as starch, sugars, fats, protein and fibre • percentage composition of foods for saturated, unsaturated (mono, poly and omega3) fats and trans fatty acids

RANGE STATEMENT	
	- soluble and insoluble fibre - micro-nutrients with positive or negative health implications - micro-nutrients that figure in Recommended Daily Intake (RDI) lists - enzymic and immunological assays
Ingredient composition	Ingredient composition, may include specification of: - gluten free, lactose free, wheat free, cholesterol, salicylates, amines, monosodium glutamate (MSG), alcohol, nuts, additives, such as maltodextrose, egg white, wheat varieties, antioxidants, flavins, soy and phytoestrogens, and glycaemic index (GI) - probiotic claims - genetically modified food, irradiation of foods or ingredients
Ingredient composition involved with the development of new processes, new products, and flavours	Ingredient composition involved with the development of new processes, new products, and flavours may include: - quantitative analysis of oils in condiments and mustards - characterisation of probiotic and prebiotic foods - characterisation of flavins and phytoestrogens - characterisation of starch variants such as resistant starch - characterisation of tannins and polyphenols in beverages - analysis of ingredients that impart flavour and colour
Checking for contaminants	Checking for contaminants may include: - identification of microbial contaminants - heavy metals - allergens - chemical contaminants that constitute either: - a public health risk with long term implications such as aflatoxin in peanuts - a food poisoning risk - spoiling of food leading to flavour changes

RANGE STATEMENT	
	and loss of sale
The test results	The test results may contribute to: • optimising production processes • nutritional information • labeling requirements • food safety • establishment, monitoring and troubleshooting of the HACCP process
Hazards	Hazards may include: • electric shock • biohazards: • microbiological organisms and agents associated with soil, air, water, animal tissue and fluids • mycotoxins • chemicals: • acids (e.g. sulphuric, perchloric and hydrofluoric) • hazardous materials, such as heavy metals and pesticides • anions (e.g. fluoride) • hydrocarbons (e.g. mono-aromatics) • sharps, and broken glassware • aerosols • flammable liquids and gases • cryogenics such as dry ice and liquid nitrogen • fluids under pressure such as hydrogen in gas liquid chromatography and acetylene in atomic absorption spectrometry • sources of ignition • dusts • high temperature ashing processes • disturbance or interruption of services
Addressing hazards	Addressing hazards may include: • use of MSDS • labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment, such as gloves, safety glasses and coveralls

RANGE STATEMENT	
	• use of fumehoods, direct extraction of vapours and gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • minimising exposure to radiation ionising such as lasers, electromagnetic and ultraviolet (UV) radiation
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing
--------------------	---------

Competency field

Competency field	
-------------------------	--

Co-requisite units

Co-requisite units		